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THE FRESH-WATER AQUARIUM.

BY CHARLES B. BRIGHAM.

[Concluded from page 490, of Vol. iii.]

A VERY valuable addition to the specimens of an aquarium may be found in what are called the cray-fishes or fresh-water lobsters. These little animals so closely resembling their salt-water relations can be kept without much trouble in the general collection. They are natives of most parts of the country, though rare or limited in their habitat in New England. In New York they are abundant in the gravelly brooks and streams, especially in those near Trenton Falls. A careful observer will, as wading into the water he searches for them, see two claws just visible in a hole in the sand or under the edge of a rock; and if he can hedge the hiding place around with his net, and also possibly his straw hat, and then give the desired specimen a slight stimulus with his hand, he will find of a sudden his cray-fish resting quietly in the trap he has set. So quick are their motions that one has to keep a sharp lookout for them or they will escape; the average length of those found near Trenton Falls is about two inches. They are quite hardy, with this exception that they cannot bear water which is much above the normal temperature. In the summer time if the tank is so placed that the sun shines upon it too forcibly, or for too long a time, we shall probably find the cray-fish resting motionless upon the gravel with its claws and tail extended and its body somewhat swollen. If this state of things has not existed too long a time, immediate removal to cold water may revive the unfortunate victim by degrees. Some day, after the cray-fish has been a quiet inmate of the aquarium for some time, we shall be astonished in finding apparently two cray-fishes instead of one. Closer examination will disclose the fact that one of them is merely the cast-off shell of the

other; and now the newly clad cray-fish appears in a coat of a pinker hue than before, and tries to keep under the plants and conceal itself, until accustomed to its new garment it can venture forth once more into its little world. Cray-fishes eat small pieces of raw beef eagerly. We shall have to be careful that they do not crawl out of the tank, for if even a tassel of a curtain is left so near the water that it can be reached, we shall find our much prized specimen some morning dried up and lifeless in a corner of the room upon the floor.

Frogs are interesting objects of study, and to many are great favorites; they are best kept in a tank with an inch or two of water, with a number of islands or resting-places above the water for them. A wire screen over the top of the tank will be necessary to keep the specimens together.

Two of the most useful and instructive sets of specimens which the aquarium contains are its snails and mussels; useful, because they act as the scavengers of the tank, and from what would otherwise be the refuse matter make their living from day to day; instructive, because they serve to illustrate in a small way the great principle by which the health and purity of all our larger ponds and lakes is maintained. The snails live upon the bits of decayed plants and the confervoid growths in the tank, and the mussels by filtering the water act as constant purifiers. There are three kinds of snails common in our ponds and streams, the *Planorbis trivolvis*, the *Paludina decisa*, and the *Lymnæa desidiosa*. Of these the best is the *Planorbis*, a snail with a shell coiled like a modern chignon; it is hardy and of clean habits, and does almost as much work as its neighbor, the *Paludina*; it is found chiefly in ponds or large streams, while the *Paludina* can be obtained in great numbers in small brooks or pond holes. The *Lymnæa* is found near the gravelly beaches of the larger ponds; it is a beautiful snail, but does not confine itself to the refuse matter, and is apt to eat eagerly the most delicate plants in the tank; it is, therefore, generally an

unwelcome visitor. Of the mussels, those found in ponds with their many rayed shells, and those river mussels with their thick, unattractive coverings, are alike useful; they move from one side of the tank to the other with ease, and we must not expect to find them always in one position; the number of snails which may be kept to advantage in a tank is very large; they are so apt to perish during the winter that it will be well to begin the season with as large a stock as two hundred for a medium sized tank; a dozen mussels of a size proportioned to the tank will be sufficient.

There are many specimens, such as fishes at the time of spawning, or those particularly fierce, or certain larvæ, which would either be destroyed or seen to disadvantage in the general collection. For each of these a separate tank is indispensable; some glass jars of strong clear material holding about two quarts, will answer every purpose, and the contents can be arranged precisely as if they were large aquaria. After one has had an aquarium in operation for some time extra tanks of this sort will be found very useful and necessary; for if a specimen gets injured or is in poor condition, a few weeks recruiting in a separate tank will often save its life; or, if we have a larger stock of plants than the large tank will accommodate at the time, when later in the winter the plants die off, then we shall wish to replace them from specimens in the reserve stock.

The instruments used for aquarial purposes are few in number and simple. We need a good net a foot or two in diameter, with very fine meshes, and a flat basket so partitioned off that it will hold four good sized jars; these jars may be of earthen-ware or of strong glass, the latter material being perhaps better, as we can then see how many specimens each jar contains without trouble. Most of the plants can be taken home (if the distance is not too great) rolled up in the net, while the mussels can occupy the room between the jars. It is very necessary to keep the plants moist, as they are much blighted if allowed to dry; if

covers for the jars are used at all they should be caps of mosquito netting held on by India-rubber rings.

For the tank a glass rod about a foot in length and a quarter of an inch in thickness will be of use in moving the specimens into place when disarranged. Too much cannot be said against unnecessarily meddling with the specimens in the aquarium; a slender rod with a sponge attached to the end of it will be useful in removing the *confervæ* from the sides of the tank; a small gauze-net three or four inches in diameter is often needed to remove dead or objectionable specimens; an India-rubber pipe several feet in length affords the simplest method of drawing off the water of the tank; a fine gauze should be placed over that end of the pipe which is in the tank, otherwise the specimens may pass through it and be lost.

Should the water in the tank become impure by any means it can often be purified by the following simple method: take a small earthen flower-pot holding about a pint, and insert a piece of sponge tightly in the opening at the base so that when the water is placed in it it will pass through the sponge only drop by drop; the pot being filled with one-third powdered charcoal and two-thirds water, place it over the tank and let it empty itself into the aquarium. The effect of this simple contrivance is astonishing and it will often save one the trouble of arranging the aquarium anew.

The time of feeding and the amount of food may depend somewhat upon the kind of stock in the aquarium. As a general rule it is better to keep the specimens under than over-fed, for they do not then by wasting their food make the water impure. Twice a week is often enough to feed them, and then very small pieces of raw beef will be found the best food; gold-fishes will not always eat the beef, and for them crumbs of bread are necessary; should we find that they do not eat all that is given we must stop the feeding at once and remove with the glass rod the neglected portion.

The process of accustoming certain salt-water fishes, such

as minnows and stickle-backs, to fresh water must be done gradually if we wish a happy result ; in this process we have an example to follow, set by nature herself, for there are instances of bodies of what were once salt waters, so freshening by degrees that they still retain seals and certain marine animals. We may find crabs in the Charles River at some distance above Cambridge, and they may be kept alive and in health for a length of time in the fresh-water aquarium.

The system of artificial aëration and that of producing an ebb and flow in the marine aquarium have been practiced with success in large collections of aquaria.

The value of the aquarium as a means of instruction cannot be overestimated, affording as it does the opportunity of studying the habits of aquatic animals in a manner attainable by no other means, and giving to all an inducement to pursue further the study of natural history which will be a pleasure throughout life.

A SKETCH OF THE TRUCKEE AND HUMBOLDT VALLEYS.

BY W. W. BAILEY.

SINCE the opening of the Pacific Railroad all have had their attention more or less turned to that vast region lying between the Sierra Nevada and the Rocky Mountains. It is known as the Great Basin ; but if, misled by the name, we conceive merely of a boundless valley, more or less desolate, we shall arrive at a somewhat erroneous conclusion. It is indeed a depression between the two giant ranges of the continent, but traversing this are successive parallel mountain chains with a north and south trend, and only inferior in altitude to the Rocky Mountains and the Sierra. Indeed, according to our eastern notions, the whole so-called basin is but a broad